Overview of North Carolina's Wetland and Stream Regulatory Programs

Presented to Indiana Headwater Forum

John Dorney, NC Division of Water Quality (DWQ)

Wetland Program Development Unit

September 13, 2007

Overview of Presentations

- Overview of NC's regulatory programs
- NC Stream Identification Method
- Headwater Streams in NC
- Wetland and Stream Functional Assessment in NC
- Stream Mitigation in NC

Backgound - NC's regulatory programs

- Wetland Water Quality Standards - 1996
- 401 Water Quality Certification rules – 1996
- Stream buffer rules – 1997 to 2000
- Activities Exempt from permitting – 2001
- Isolated Wetland rules – 2001

Background - Wetland Water Quality Standards

- Wetland Uses
- Wetland Standards
- Exempt Activities – mirror 404 exemptions in Clean Water Act

Background - 401 Water Quality Certification Rules

- Adopt general process of avoid, minimize, mitigate
- Not degrade surface or groundwaters
- No cumulative impacts
- Stormwater management crucial

Background - Mitigation and 401 Certification rules

- Wetland and stream mitigation
- Coordinate with Corps of Engineers
- 1:1 restoration/creation requirement for wetlands
- Restoration preferred
- One acre impact threshold for wetlands
- Stream mitigation rules vague

Background - Riparian Buffer Rules

- Adopted in specific river basins with severe water quality problems
  - Neuse River basin
  - Tar-Pamlico River basin
  - Randleman Lake watershed
- 50 foot wide, wooded buffer
- Focused on nutrient removal
- Rules more stringent than 404/401
  - Crossings allowable
  - Other activities done outside buffer
  - Diffuse flow or on-site stormwater management

Background - Isolated Wetland Rules

- Adopted in 2001 in response to US Supreme Court case (SWANCC)
- Before rules, no impact on isolated wetlands could be approved since wetland standards protect them unless have permitting process to allow impacts
- Rules very similar to 401 rules to keep process as consistent as possible
- Applies to isolated wetlands and isolated streams

Topics to discuss in detail

- I. Stream identification
- II. Headwater streams
- III. Wetland and stream functional assessment
- IV. Stream Mitigation

I. NC Stream Identification Method

- Developed for buffer rules
- Corps of Engineers does not have stream identification method
- DWQ method revised about every two years
- Four-day training class for staff, local governments, foresters and consultants
- More details in slide show

II. Headwater Streams in NC

- Stream mapping
- Biology and hydrology of small streams
- Use of macrobenthos in stream identification esp. perennial streams
- Details in presentations

III. Wetland and Stream Functional Assessment in NC

- Ongoing initiative – still being developed
- Done jointly with wide variety of state and federal agencies including EPA and Corps of Engineers
- Multi-year process
- Develop rapid (15 minutes) field assessment methods
- Once methods developed, conduct training
- Details in presentation

Stream Mitigation

- Various efforts sicne 2003
- Other efforts being discussed. For instance, flexible stream mitigation
- Joint efforts between all relevant state and federal agencies

Separate Presentations for these four topics

- Will discuss in general
- Details available in presentation but will not discuss in detail
- More details from website at h2o.enr.state.nc.us/ncwetlands, email me at john.dorney@ncmail.net or call at 919-733-9646.

Field Identification of Low Order Streams and Stream Origins:
The NC Method

Periann Russell
Department of Environment and Natural Resources
Division of Water Quality

N.C. Division of Water Quality

Identification Methods for the Origins of Intermittent and Perennial Streams

Version 3.1, 2-28-05

Background

- Developed in 1998 by NCDWQ staff; Eric Fleek is the author of the first draft; became Ver. 1
- Modified/approved on 1-19-99 by the NC Stream TAC Co-Chaired by John Dorney (NCDWQ) and James Gregory; Ver. 2
- Version 3 -
  - Combined intermittent and perennial stream identification methods into one manual
  - Choice of 3 methods for perennial stream identification
  - Modified and simplified the field form without changing the score required for intermittent call
  - Version 4.0 in the works

Applications

- The "Methods" are not a regulation but are used to determine stream types and stream origins for application of regulations – provides relative ease in updating the methods as the science develops.
  - Intermittent origins – riparian buffer rules: Neuse and Tar-Pamlico River Basins, Randleman Reservoir Watershed
  - Perennial origins – buffer rules; NCDWQ for "Waters of the State" determinations, mitigation for 401 certifications for stream impacts, etc.
  - NC Stream TAC (mainly Dorney and Gregory) are "gently" pressuring other agencies to standardize on the definitions and stream identification methods that we have developed

Principles of Application of the NCDWQ Methods

Strong science base

- Methods have been reviewed/revised by a broad-based group of scientists and practitioners
- Methods have been systematically tested across NC and widely applied in VA.
- Continuing research is devoted to learning more about the characteristics of headwaters streams.
- The methods are being considered for use by EPA Region 4 (Southeast).

Principles of Application of the NCDWQ Methods

- Methods provide a consistent approach to stream identification and origin location
- With proper training, experienced professionals readily learn to apply the methods
- ***The methods are a tool to support "best professional judgment"!!***

Evaluating a Stream: the Basics

- Do not evaluate a stream within 48 hours of substantial rainfall
- Site Information
- Three groups of indicators - Geomorphology, Hydrology & Biology, in accordance with the stream definitions
  - Primary indicators: 0-3 points
  - Secondary indicators: 0-1.5 points
- Each indicator is evaluated in terms of presence and degree of development: Absent, Weak, Moderate or Strong
- When evaluating an indicator, examine a reach of the stream at least 100 ft long to determine the average condition for the indicator
- Total points
  - ≥ 19: strong evidence of an intermittent stream
  - ≥ 30: strong evidence of a perennial stream
  - Final decision is a "best professional judgment call – document why if decision is different than indicated by the score

Flow Duration and Process

- An ephemeral stream is dominated by sediment transport; flow occurs in response to storm runoff; no connection with groundwater.
- An intermittent stream is dominated by sediment transport, but some deposition of sediments may occur; seasonally connected to groundwater.
- A stable perennial stream is in approximate equilibrium with regard to sediment transport and deposition; high energy flow to transport; deposition when flow recedes; connected to groundwater.

- Each section represents an important component of stream function
- Each item represents a process or characteristic dependent on a process

Geomorphology – Channel Development

Features that result from physical processes associated with discharge, velocity, gradient, sediment transport and deposition

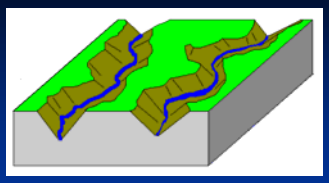
Hydrology – Flow Regime

Features that result from processes associated with flow duration and surface water and groundwater interactions

Biology – Continuous Presence of Water

Features related to and dependent on the flow duration and stream habitat

Geomorphology - Channel Development



The Ideal Stream Cycle (W.M. Davis, 1880) Not a Literal Time Sequence

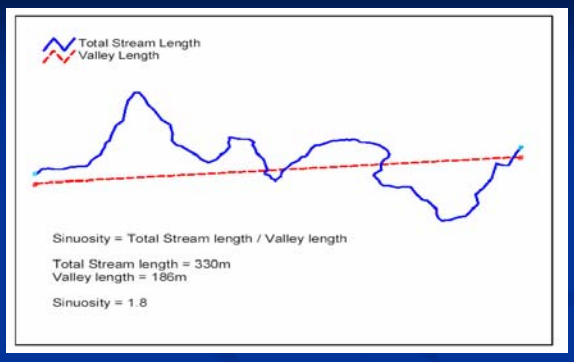
1. Continuous bed and bank

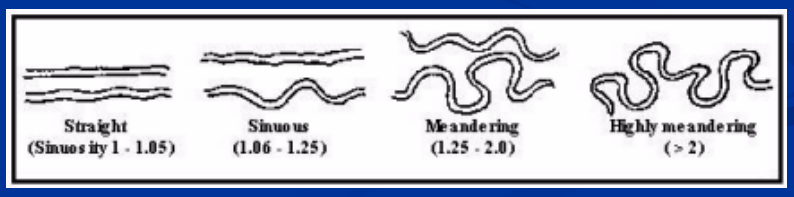
channel formation (eroded) through the soil profile

2. Sinuosity

The degree of 'curviness' of a stream or river

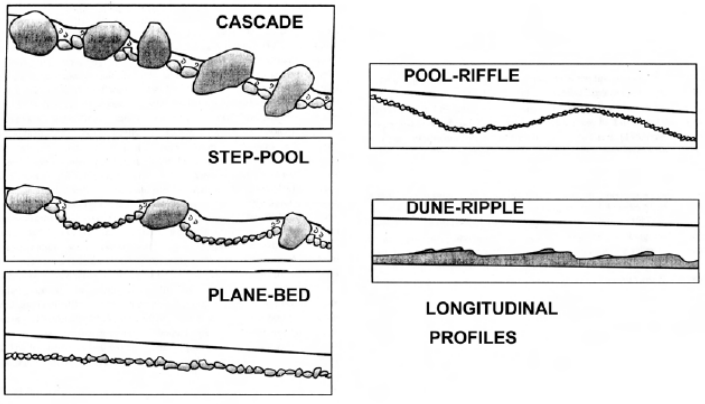
Related to bed material size, gradient, and discharge

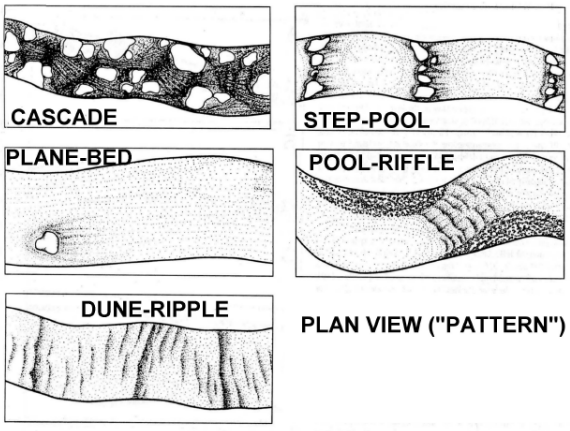




3. In-channel Structure

- **Cascade and Step-Pool**
  - Higher Gradient
  - Mountains, Upper Piedmont
  - Boulder, Cobble, Gravel
- **Pool-Riffle or Pool-run**
  - Low to Moderate Gradient
  - Piedmont, Mountains, Coast
  - Cobble, Gravel, Sand, Silt
- **Pool-Ripple**
  - Low Gradient
  - Coast Plain
  - Sand (usually homogeneous)





4. Soil texture or streambed sorting

- coarse substrate relative to stream banks and adjacent areas

  channel formation (eroded) through the soil profile

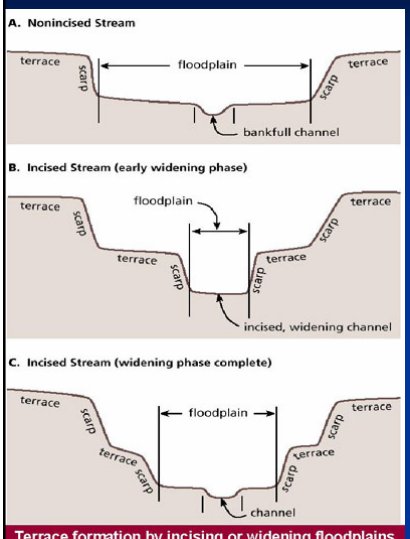
- sorting of different sizes of substrate materials

  Denotes high energy flow, availability of sediment and organization

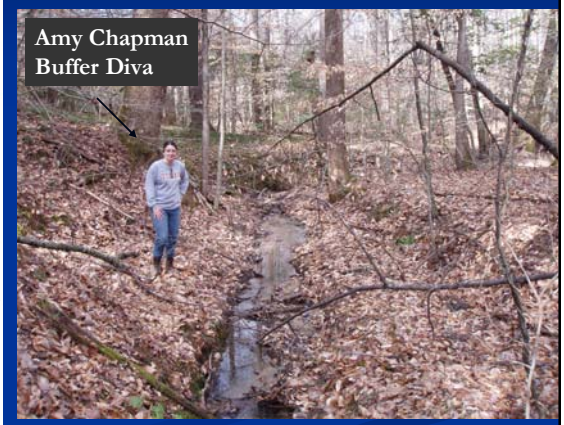
Well sorted

Poorly sorted

5. Active or Relic Floodplain



Terrace formation by incising or widening floodplains



6. Depositional Bars or Benches

… accumulations of gravel, sand or silt creating a bar or bench which may or may not be covered with vegetation …

Bankfull Bench

If the stream has downcut due to changes in the watershed or streamside vegetation,
the floodplain stage indicator may be a small bench or scour line on the streambank.
If the stream is not entrenched, then bankfull is near the top of the bank.

7. Braided Channel

- easily eroded banks - widespread bank erosion
- abundant bed material/bed load; often large sized
- rapid & frequent variations in discharge disallows vegetation to establish on bars

Tien Shan Mtns, Kyrgyzstan

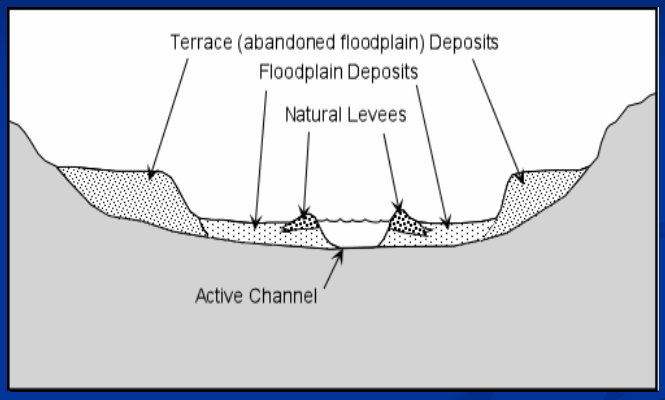
Resurrection River, Kenai Peninsula, Alaska

8. Recent Alluvial Deposits

9. Natural Levee

Natural levees are formed from numerous flood deposits that create low ridges of coarse sediments along river channels.

Sediment sorting during overbank conditions results in lateral fining of flood deposits.



10. Headcut

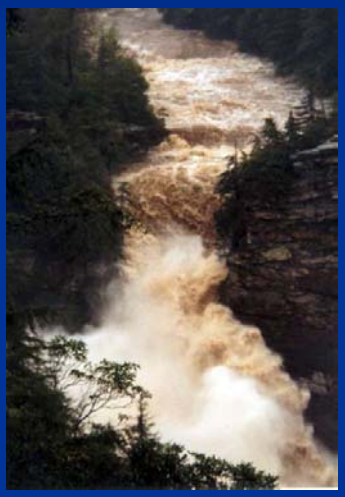
… an abrupt vertical drop in the bed of a stream channel that is an active erosion feature …

Headcut /degradation process

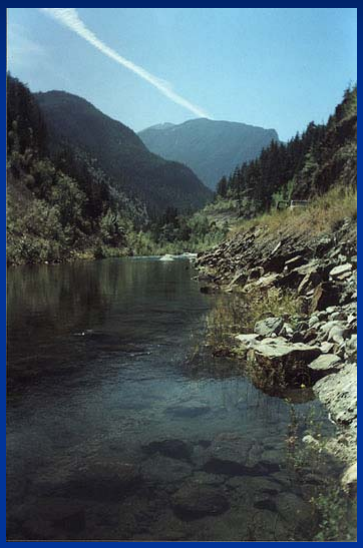
- result of concentration of flow energy or stresses over a localized area
- migrate upstream due to hydraulic stresses at the overfall
- seepage at the base of the headcut
- gravitational forces on the earthen mass
- weathering processes
- local earthen material properties.

11. Grade Control

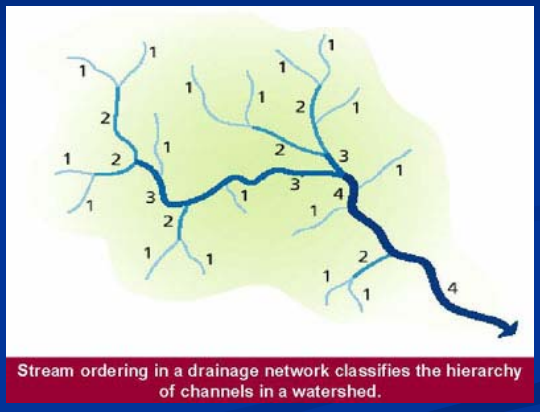
… a structural feature in the channel that separates an abrupt change in grade of the stream bed or a point where erosional downcutting has been stopped by an obstruction … bedrock outcrops (nick points), large stones, large wood jams, sometimes large roots…



12. Natural Valley or Drainage Way



13. Second or greater order channel on existing USGS or NCRS maps



Stream ordering in a drainage network classifies the hierarchy of channels in a watershed.

Strahler (1957)

Hydrology

Surface water systems (wetlands, streams, reservoirs, and lakes) are directly connected to, controlled by, and are surface expressions of the groundwater systems. ***Base flow in streams, no matter how small, is discharge from the regional groundwater system***

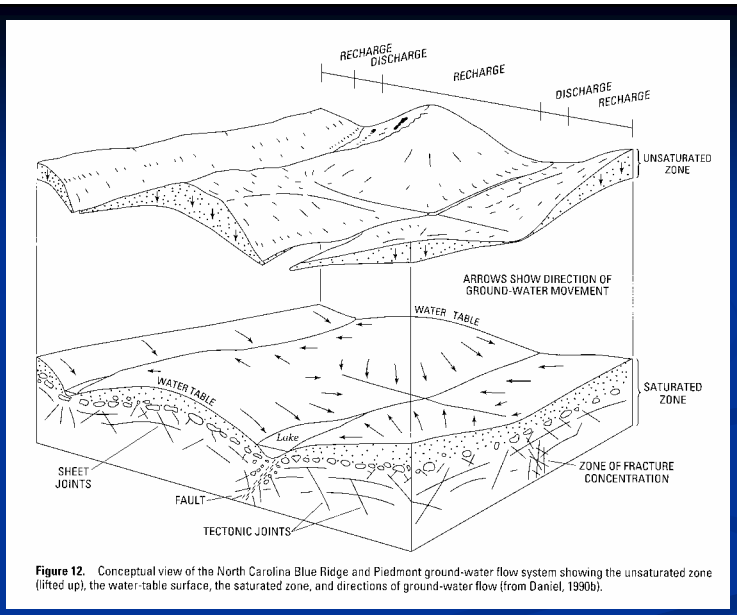
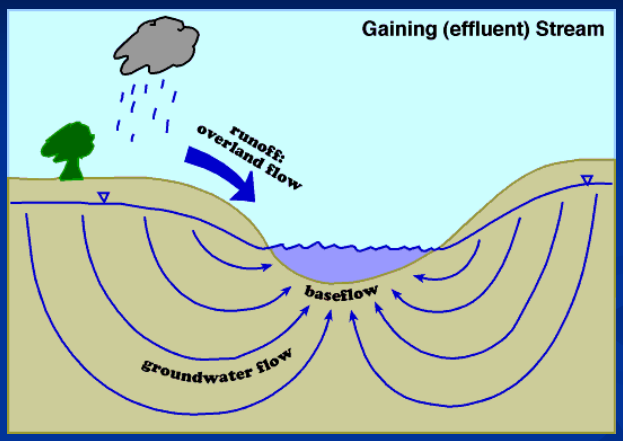


Figure 12. Conceptual view of the North Carolina Blue Ridge and Piedmont ground-water flow system showing the unsaturated zone (lifted up), the water-table surface, the saturated zone, and directions of ground-water flow (from Daniel, 1990b).

Piedmont and Mountains: Groundwater is contained in the regolith (soil and saprolite) and upper fractured zone of the bedrock which are hydraulically connected and behave as one aquifer.

14. Groundwater Flow or Discharge



15. Water in Channel and > 48 hours since rain
OR
Water in Channel during the dry or growing season

16.Leaf litter

Indicative of Flow duration

17. Sediment on Plants or Debris

Flow

Sediment Transport (Suspended)

Deposition

18. Organic Debris Lines or Piles

Indicative of Flow

19. Hydric Soils (and Indicators)

Indicates sufficient duration of

Saturated conditions
Flooding
Ponding

Development of anaerobic conditions

Biology

Biological processes and species are dependent on flow duration, water quality and habitat formed and maintained by the physical processes in channels.

20. Fibrous Roots in Channel

Low frequency of
Water/Flow
Surface/GW interaction

Fibrous roots /O_2
Intolerant of water
Consistent flow

21. Rooted Plants in Channel

Low frequency of
Water/Flow
Surface/GW interaction

Deterrent to plant
establishment by
removing seeds
Prevent aeration

22. Crayfish
23. Bivalves
24. Fish

25. Amphibians

26. Macrobenthos

27. Filamentous Algae/Periphyton

28. Iron-oxidizing Bacteria or Fungus

Indicative of groundwater discharge

29. Plants in Streambed

OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-33%).
UPL	Obligate Upland	Occurs in wetlands in another region, but occurs almost always (estimated probability 99%) under natural conditions in non-wetlands in the regions specified. If a species does not occur in wetlands in any region, it is not on the National List.

* *National List of Plant Species That Occur in Wetlands: Southeast Region 2*. 1988. U.S. Fish and Wildlife Service


QUESTIONS?

Stream Biology:

Role of Aquatic Animals in Stream Identification

BENTHIC
MACROINVERTEBRATES
INCLUDE

Ephemeroptera -Mayflies
Plecoptera - Stoneflies
Trichoptera - Caddisflies
Odonata - Damsel and Dragonflies
Coleoptera - Beetles
Megaloptera - Dobson and Alderflies
Diptera - True flies
Oligochaeta - Aquatic worms
Crustacea - Crayfish, Amphipods and Isopods
Mollusca - Snails and Clams

Why use Benthos

- Found in all aquatic habitats
- Easily and inexpensively collected
- Most life cycles are at least one year or more
- Important in the diets of fish

Benthos are the most diverse aquatic life in streams

Functional Feeding Groups in Streams

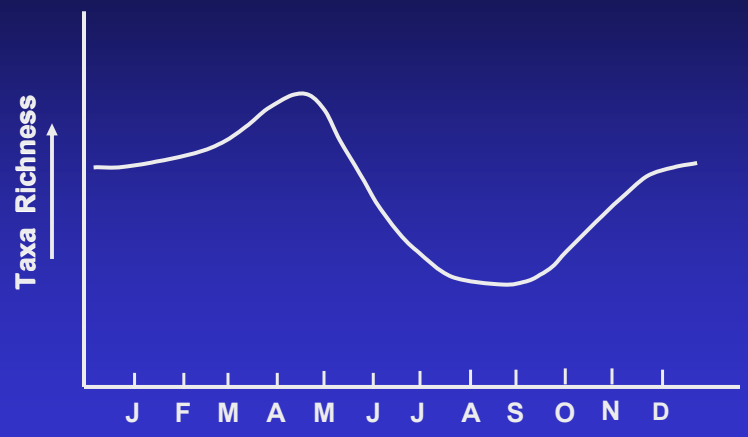
Include the following groups:

- shredders
- grazers / scrapers
- filter feeders
- predators

Sources of Variability

- Seasonality
- Effects of stream size (continuum)
- Effects of flow
- Taxonomic consistency

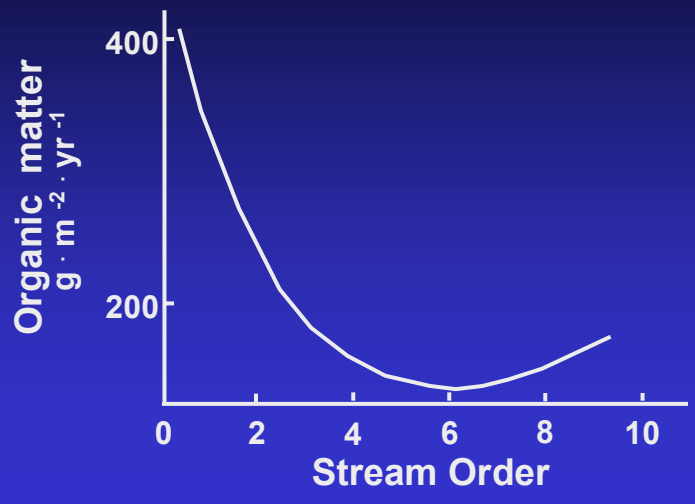
Seasonality



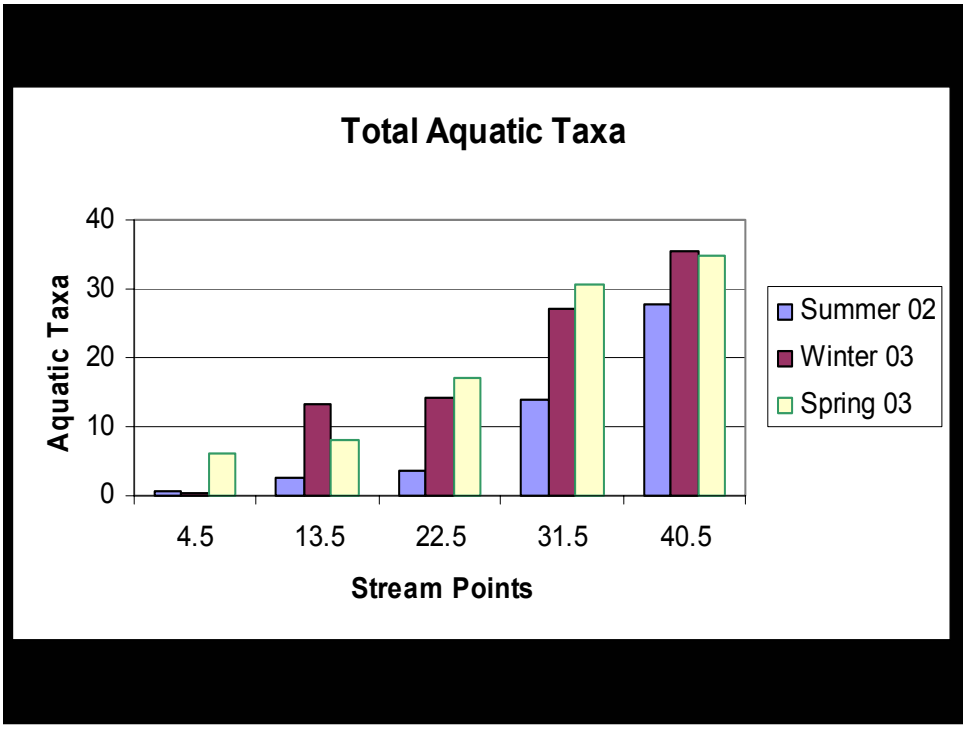
Biology of Headwater Streams

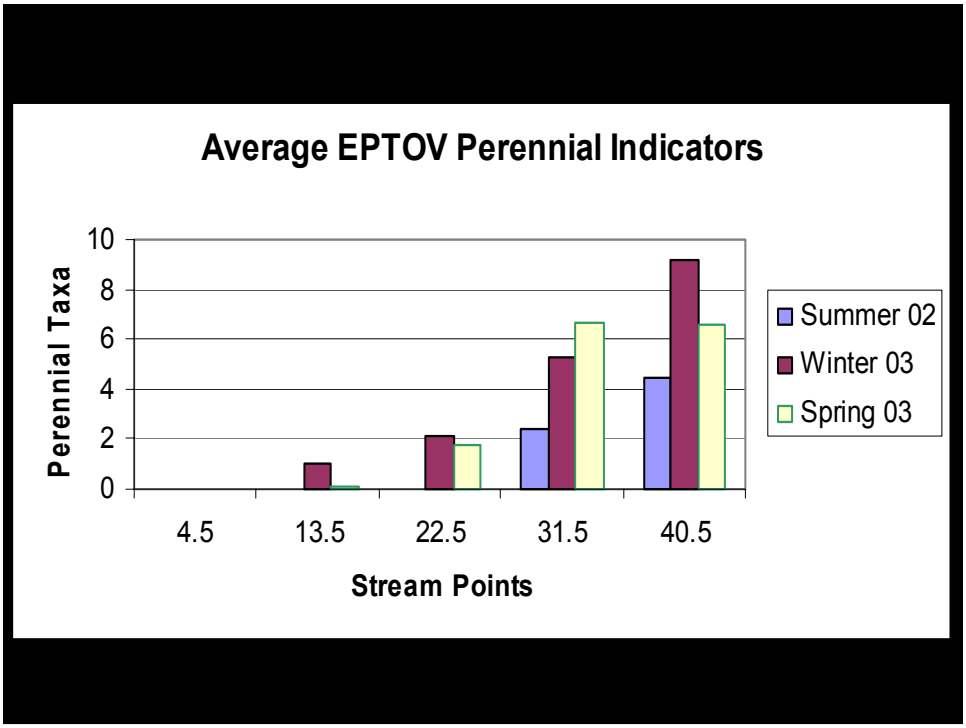
Annual Organic Input

$(g \cdot m^{-2} \cdot yr^{-1})$



Habitat Heterogeneity and Stream Order


Total Aquatic Taxa
Aquatic Taxa
40
30
20
10
0
4.5
13.5
22.5
31.5
40.5
Stream Points
Summer 02
Winter 03
Spring 03


Average EPTOV Perennial Indicators
Perennial Taxa
10
8
6
4
2
0
4.5
13.5
22.5
31.5
40.5
Stream Points
Summer 02
Winter 03
Spring 03

Stream Type	fauna
Ephemeral	Arachnids, etc.
Intermittent	Crustacea
Perennial	Primary indicators

Identification of Perennial Stream Origin

Fairfax County Method Biology

- Any EPT taxa 3 points
- Clams - primary indicator 0-3 points
- Benthos, Fish & Amphibian 0-1.5 each secondary indicators
- Total possible biology points 10.5
- Total likely biology points 7
- Total points to be perennial 25

New NC Perennial Stream Definition

- Presence of any one of following taxa: fish, crayfish, salamanders, big tadpoles, clams

OR

- Score of 30 points on stream form.

New NC Perennial Definition (cont.)

- OR
- Presence of other long-lived taxa (Perennial Indicators).

NOT Indicators

- No legs

Midges, other diptera, worms

- Lots of legs

Amphipods, isopods

- Fast swimming beetles
- Semi-aquatic bugs
- Winter stoneflies


blackflies


© JER, WLU Dept. of Biology

Bugs in Limbo


Fingernail Clams


Crayfish
Cambarus sciotensis
© Roger F Thoma

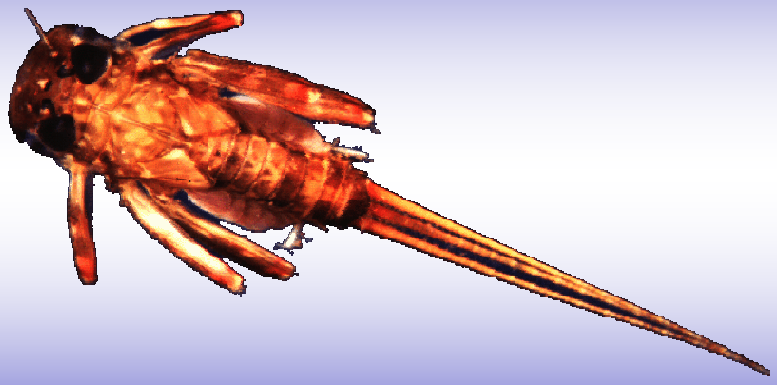
Perennial Indicator Taxa

- Mayflies
- Stoneflies (not Winter)
- Caddisflies (except Philopotamids, some Limnephilids)
- Odonates (Damsel and Dragonflies)
- Beetles (Riffle Beetles, Water Pennies and *Helichus* adults)

Mayflies

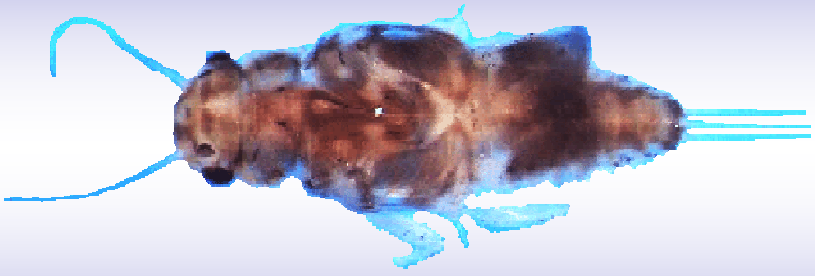
Three tails

Heptageniidae

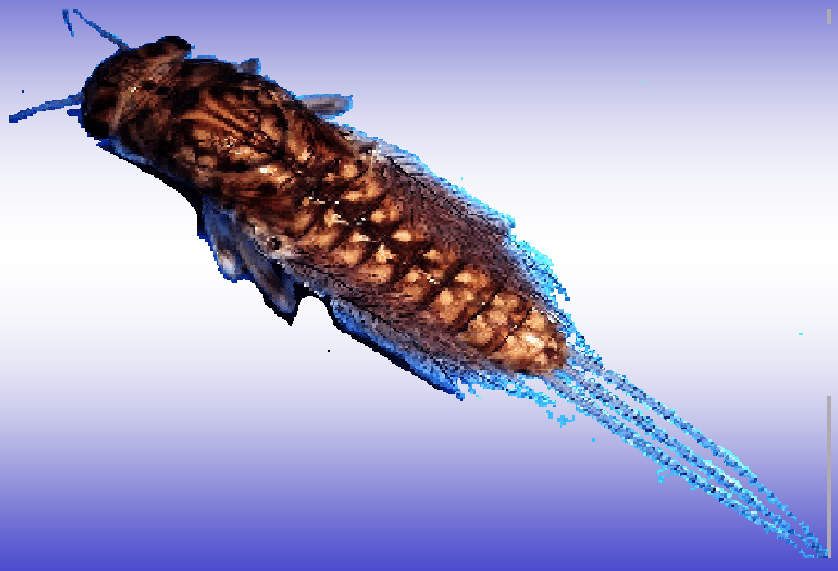


Oligoneuridae

Caenidae



Leptophlebiidae

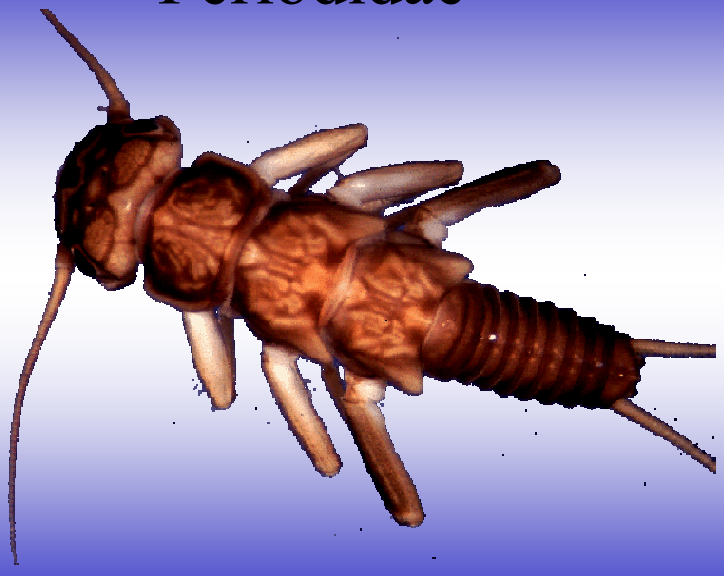


Stoneflies

Two tails

Peltoperlidae

Perlodidae



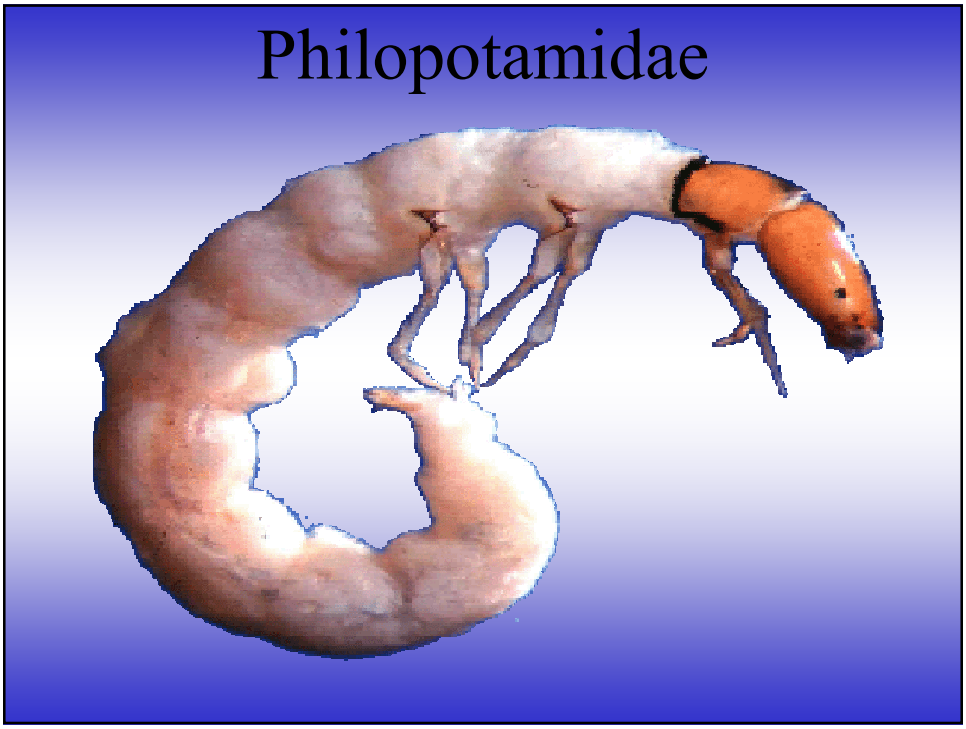
Caddisflies

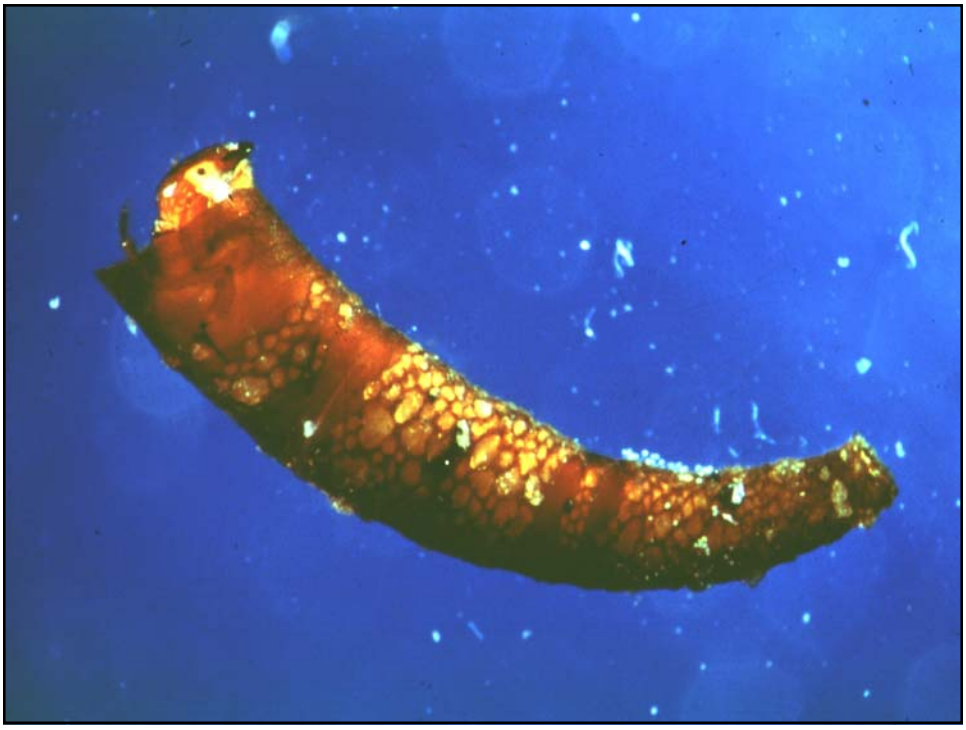
No tails (anal hooks)

Hydropsychid net

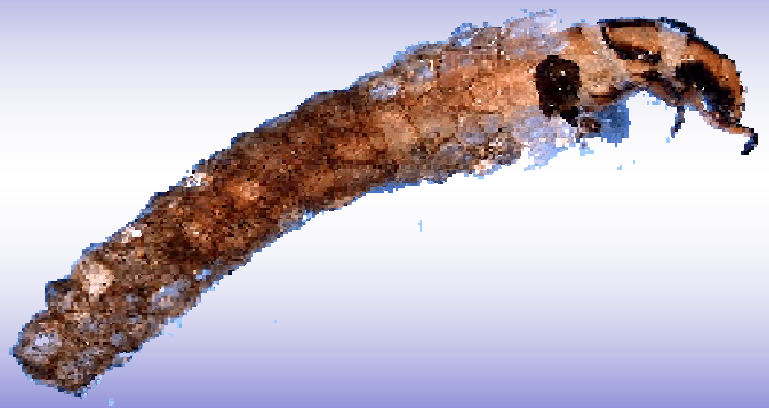
Limnephilidae

Philopotamidae





Odontoceridae



Odonates

Damsel

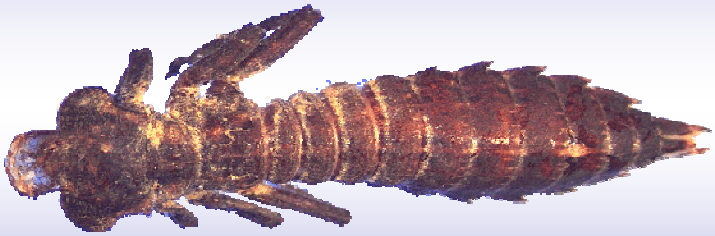
and

Dragonflies

Calopterygidae

Cordulegastridae

Aeshnidae



More Perennial Indicators

- Megaloptera (Dobsonfly)
- Large Dipterans
- Beetles
- Molluscs
- Vertebrates (salamanders and fish)

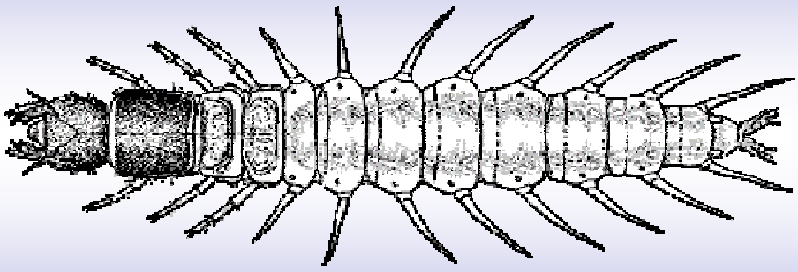
Other Flies

Dobsonfly,

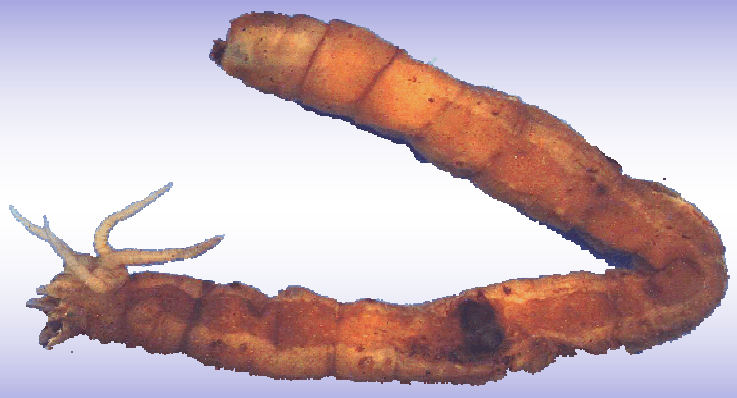
Cranefly,

Phantom Cranefly

Dobsonfly



Cranefly

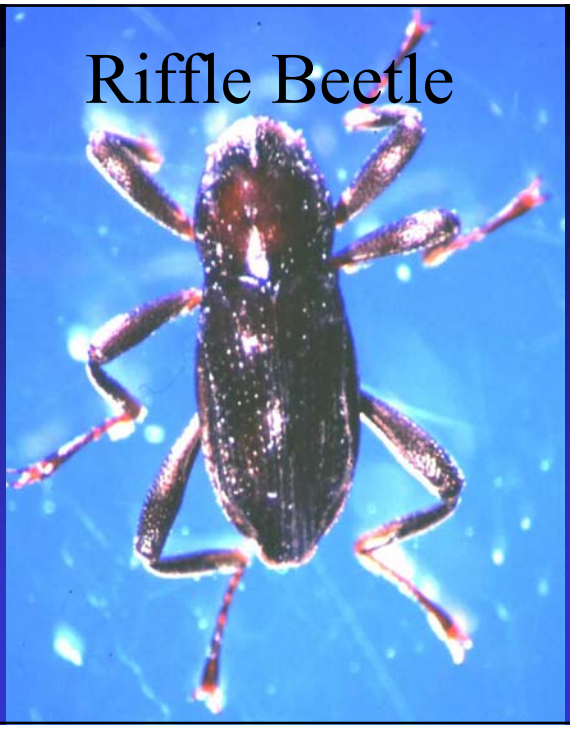


Ptychopteridae

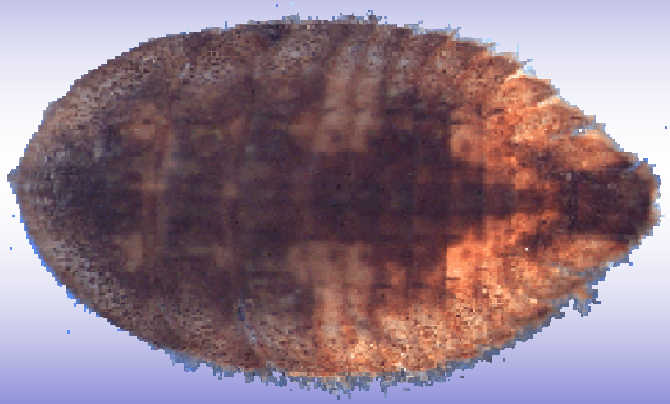
Beetles

Riffle beetles,
Water pennies

Riffle Beetle



Water Penny



Snails

Limpets,

Right-handed snails

Ancylidae

Pleuroceridae

Vertebrates

Fish,

Amphibians

Headwater Streams and Wetlands in North Carolina: A Summary

John Dorney, NC Division of Water Quality

Prepared for Regional Science Workshop on
Headwaters and Associated Wetlands
Philadelphia, PA
June 20-21, 2006

Background

- North Carolina conducting research on headwater streams and headwater wetlands since 2001.
- Funding through EPA Wetland Program Development Grants.
- Work on headwater streams complete but work on headwater wetlands ongoing.

Headwater Streams

- Field studies – intensive mapping of intermittent and perennial stream origins in 1000 + acre watersheds.
- USGS maps are very inaccurate.
- Use Division of Water Quality stream identification method.
- Seven watersheds across the state.
- Work completed.

Headwater Streams (cont.)

- Percent of stream length by stream order

	First order	Second order	Third order
Coastal Plain	71%	22%	7%
Piedmont	58%	30%	8%
Mountains	37%	22%	13%
Total	**50%**	**26%**	**10%**

Aquatic Life

- Intermittent streams have significant aquatic life.
- Amounts of aquatic life in between ephemeral and perennial streams.
- Varies with wet or dry season.
- Ephemeral streams do not have aquatic taxa

Aquatic Life (cont.)

	Aquatic Taxa Abundance		Aquatic	
	Piedmont	**Mountains**	**Piedmont**	**Mountains**
Ephemeral	4	3	34	6
Intermittent	16	15	162	239
Perennial	30	32	286	402

Headwater Wetlands

- Headwater wetlands – located on first order stream.
- Piedmont and coastal plain study.
- 23 study sites – on-going work.
- Monitor water quality (chemistry), groundwater, amphibians, and macrobenthos.

Headwater Wetlands (cont.)

- Water quality value – important filters due to landscape position.
  - Significant reductions in sediment, nutrients and heavy metals
- Important habitat for amphibians.
  - 26 species found (of 53 species in state).
- Store groundwater.

Conclusions

- Headwater (including intermittent) streams provide significant aquatic life (macrobenthos) and water quality functions.
- Headwater streams are significant portion of state streams.
- Headwater wetlands provide significant aquatic life (amphibians) and water quality functions.

NC Wetland Assessment Method – Overview and Relationship to EMC's Wetland Rules

Presentation to Water Quality Committee of the NC Environmental Management Commission

May 9, 2007

Raleigh, NC – Home of the Stanley Cup 2005 - 2006

NC Wetland Functional Assessment Team (WFAT)

- Developed by interagency team from 2003 to 2006
  - Federal agencies
    - US Army Corps of Engineers – Dave Lekson and Amanda Jones
    - Environmental Protection Agency – Becky Fox
    - Federal Highway Administration – Donny Brew
    - US Fish and Wildlife Service – Howard Hall
  - State agencies
    - NC Department of Transportation – LeiLani Paugh (co-chair)
    - NC Division of Coastal Management – Melissa Carle and Steve Sollod
    - NC Division of Water Quality – John Dorney (co-chair)
    - NC Ecosystem Enhancement Program – Jim Stanfill
    - NC Natural Heritage Program – Mike Schafale
    - NC Wildlife Resources Commission – David Cox
  - Consultants – Ecoscience, Corp. (Sandy Smith, Matt Cusack and Brad Allen)

Background

- Presently, DWQ and Corps regulate stream and wetland fill by length and acres, respectively
- Interest in DENR, DOT and Corps of Engineers administration to regulate based on wetland and stream value (quality).
- Strong support in EMC, Corps and EPA rules for this approach.

Progress to date

- NC Wetlands Assessment Method (NC WAM) essentially completed
- Interagency Team met for past 3 years
  - Developed rapid assessment method
    - "Rapid" method defined as taking no more than 15 minutes per site after training
  - Beta-tested method with Regional Office staff and others including consultants
  - Final method done early May 2007

What is NC WAM? General considerations

- High, Medium and Low values – by separate function and overall
- Within wetland type
- Comparisons between wetland type – regulatory agency decision
- Condition – compare to reference site
- Opportunity noted – use as appropriate

Three Main Functions

- Hydrology
- Water Quality
- Habitat

Hydrology

- Surface storage and retention
- Subsurface storage and retention

Water Quality

- Particulate change
- Soluble change
- Pathogen change
- Physical change
- For interstream flat wetlands – NC WAM uses “Pollution Change” instead

Habitat

- Physical structure
- Vegetation composition
- Landscape patch structure
- Uniqueness

Key to Wetland Types

- Identified and described 16 general wetland types with dichotomous key (see handout)
- Narrative descriptions with soil, plant species, landscape position, etc.
- Correlated with
  - Natural Heritage Types,
  - NC CREWS (Coastal Management) Types, and
  - HGM Types

Families of Field Evaluation Sheets

- Stressor-Based
- Riparian
- Non-Riparian

Stressor-Based Forms

Assume high quality unless stressors lower function

- Mountain Bogs
- Salt/Brackish Marsh
- Estuarine Woody
- Non-Tidal Freshwater Marsh
- Tidal Freshwater Marsh
- Pine Savannas
- Seeps

Non-Tidal Freshwater Marsh, Concord, NC

Riparian Family

- Bottomland Hardwood Forest
- Riverine Swamp Forest
- Headwater Forest
- Floodplain Pool

Floodplain Pool
Deep River near Sanford, NC

Riverine Swamp Forest
Raleigh, NC

Non-Riparian Family

- Pocosin
- Hardwood Flats
- Pine Flats
- Small basin Wetlands
- Non-Riverine Swamp Forest

Small
Basin
Wetland in
Mecklenburg
County, NC

Pretty Pond Bay
Robeson County, NC

Overall Evaluation Process

- One Field Assessment Form (four pages) with all metrics
- Form completed in field with some office map work
- Evaluate with rating calculator (computer program)
  - Boolean logic completed by Team for each wetland type
  - Systematic combination of each subfunction
- Generates rating of High, Medium or Low for each of up to ten sub-functions, three functions and then one overall rating (see example).

Field testing and calibration

- Tested on more than 85 sites across state
- Tested more than one example of each of the 16 wetland types
- Tested pristine and impacted sites (high and low)
- Beta testing completed
  - Raleigh with 14 testers
  - Asheville with 18 testers
  - Washington/Wilmington with 26 testers
- EPA grants underway to calibrate/modify NC WAM as needed in next three years

Wetland Tool Box

- Web-based compilation of known and evaluated wetland sites
- Site maps
- Photos
- Completed forms
- Use to calibrate and train staff
- Anyone will be able to submit/post sites
- When done, available to public – maintained by DWQ?

Final phase

- Draft version of report to joint public notice in May 2007
- Final version after public comments – June 2007
- When complete, will replace DWQ Wetland Rating System
- Training for agency staff in fall and winter 2007
  - Three day class in Raleigh
  - Written manual
  - Field and lecture
  - Written test
  - Additional days in mountains and coastal plain
- Training for private sector later in 2007/2008

Implementation Approach

- NC WAM is the tool. Next question, how to use it.
- Decision by regulatory agencies not Wetland Team.
- Implementation Team has met four times – DWQ, Corps, EPA and DCM.

Implementation (cont).

- Will use NC WAM for
  - Avoidance and minimization
  - Mitigation
  - Training
- In general, impacts to lower quality wetlands will require less mitigation and be easier to permit.
- Impacts to higher quality wetlands will require more mitigation and be harder to permit.
- Essentially, we will replace functions instead of acres for wetlands

Relationship of NC WAM to existing EMC's Wetland Rules

- Numerous references to evaluation of wetland quality in existing EMC rules
  - Wetland Evaluation methods (15A NCAC 2B .0103 (c)
  - 401 Water Quality Certification (15A NCAC 2H .0500)
  - Isolated Wetland rules (15A NCAC 2H .1300)

I. Wetland Evaluation Methods

- Director can approve methods which "…have been demonstrated to provide verifiable and repeatable results and that have widespread acceptance in the scientific community." (15A NCAC 2B .0103 (c)).
- NC WAM designed to address "existing uses" of wetlands as outlined in 15A NCAC 2B .0231.

II. 401 Water Quality Certification Rules

- Mitigation based on acreage (1:1 replacement) "…unless the Director determines that the public good would be better served by other types of mitigation." (15A NCAC 2H .0506(h)(6)).
- Use of wetland evaluation method referred to in rules (15A NCAC 2H .0506 (a)).

II. 401 Water Quality Certification Rules (cont.)

- Restoration preferred unless "… the proposed alternative (mitigation) is the most ecologically viable method of replacing lost functions and values."
- Therefore, existing EMC rules contain provisions to conduct wetland mitigation based on functional replacement rather than just acreage.

III. Isolated Wetland Rules

- Mitigation based on acreage (1:1 replacement) "…unless the Director determines that other forms of mitigation would provide greater water quality or aquatic life benefit." (15A NCAC 2H .1305 (g)(7)).
- Use of wetland evaluation method referred to in rules (15A NCAC 2H .1305(a)).

III. Isolated Wetland Rules (cont.)

- Restoration preferred unless "… the proposed alternative (mitigation) is the most ecologically viable method of replacing lost functions and values."
- Therefore, existing EMC rules contain provisions to conduct isolated wetland mitigation based on functional replacement rather than just acreage.

Implementation Schedule

- Final NC WAM draft by end of April 2007
- Joint public notice in May 2007
- Final guidelines after public comment – June 2007
- Implementation by Corps and DWQ after more discussions with EEP and DOT– separate public notice and comments in fall 2007

Questions?

NC Stream Mitigation Program

Indiana Headwater Forum

September 14, 2007

Background

- Developed joint Federal-State stream mitigation guidelines in 2003
  - Corps of Engineers
  - US Environmental Protection Agency
  - NC Division of Water Quality
  - NC Wildlife Resources Commission
- In 2005, developed Dam Removal Guidelines
- In 2006, developed Outer Coastal Plain headwater stream mitigation guidelines

Stream Mitigation Guidelines

- Definitions of stream mitigation
- Ratios based on stream quality (no method to determine that yet – being developed)
  - Poor to fair 1:1
  - Good 2:1
  - Excellent 3:1
- Ratios based on mitigation type
- Selection of mitigation sites
- Buffer widths
  - 50 feet in coastal plain and piedmont
  - 30 feet in mountains

Stream Mitigation Guidelines (cont)

Note:This example assumes a poor to fair quality stream (higher ratios if higher quality)

Mitigation Type	Mitigation Activity Multiplier	Linear Feet of mitigation required	Linear feet of mitigation work required (by type)
Restoration	1.0	100	100 linear feet
Enhancement I	1.O to 1.5	100	100 to 150 lf
Enhancement II	1.5 to 2.5	100	150 to 250 lf
Preservation	2.5 to 5.0	100	250 to 500 lf

Dam Removal Guidelines

- Developed by joint state and federal technical committee
- Purpose – to provide compensatory stream mitigation for dam removal projects
- Selection criteria for dam projects
- Methodology to determine credits
  - Water quality and habitat value
  - Protected buffers
  - Endangered species
  - Anadromous fish species

Dam Removal Guidelines (cont.)

- Plan to use for dam removal in mountains for FERC relicensing
- Used for two dams already
  - Lowell dam in coastal plain
    - Anadromous fish (Shad) recolonized reach above old dam
  - Carbonton dam in piedmont
    - Cape Fear shiner (federal endangered species) recolonized area

Removal of Carbonton dam in 2005

Dam Removal Guidelines (cont.)

- Guidelines now being revised by state and federal agencies
- Will put out to public notice for public comment
- Revised guidelines in late 2007 or early 2008

Outer Coastal Plain Headwater Stream Guidelines

- Developed by Corps and Division of Water Quality
- Purpose – to develop “stream” mitigation guidelines for first order, low energy streams in outer coastal plain
- Problem – stream designers were proposing streams with a lot of excavation
- Need distinct (although subtle) valley
- Use LiDAR data, soil maps, and topo to identify valley

Outer Coastal Plain Headwater Stream Guidelines (cont).

- Solution – if fill ditch to restore floodplain hydrology and plant woody buffer, get stream credit for length of valley plus riparian wetland credit
- Being implemented by various mitigation providers in state
- Applied to outer coastal plain only

Calopterygidae

Questions?

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